

Draft Screening Assessment

**Acetonitrile
(Nitriles Group)**

**Chemical Abstracts Service Registry Number
75-05-8**

**Environment and Climate Change Canada
Health Canada**

June 2019

Synopsis

Pursuant to section 74 of the *Canadian Environmental Protection Act, 1999* (CEPA), the Minister of the Environment and the Minister of Health have conducted a screening assessment of one of six substances originally referred to collectively under the Chemicals Management Plan as the Nitriles Group. The substance in question, acetonitrile (Chemical Abstracts Service Registry Number [CAS RN¹] 75-05-8) was identified as a priority for assessment as it met categorization criteria under subsection 73(1) of CEPA. The other five substances were determined to be of low concern through another approach, and the decisions for these substances are provided in a separate report.²

Acetonitrile was included in a survey issued pursuant to a CEPA section 71 notice. There were no reports of manufacture of acetonitrile above the reporting threshold of 100 kg during the 2011 calendar year in Canada. Acetonitrile was reported as being imported into Canada during the 2011 calendar year with a total volume in the range of 10 000 to 100 000 kg for use in laboratories.

Acetonitrile was measured in ambient and indoor air in Canada, as part of a series of residential air quality studies (2005-2010). Acetonitrile occurs naturally (for example, in coal tar, volcanic gas, and the combustion products of wood and other biomass) and is also present in tobacco smoke.

The ecological risk of acetonitrile was characterized using the ecological risk classification of organic substances (ERC), which is a risk-based approach that employs multiple metrics for both hazard and exposure, with weighted consideration of multiple lines of evidence for determining the risk classification. Hazard profiles are based principally on metrics regarding mode of toxic action, chemical reactivity, food web-derived internal toxicity thresholds, bioavailability, and chemical and biological activity. Metrics considered in the exposure profiles include potential emission rate, overall persistence, and long-range transport potential. A risk matrix is used to assign a low, moderate or high level of potential concern for substances based on their hazard and exposure profiles. Based on the outcome of the ERC analysis, acetonitrile is considered unlikely to be causing ecological harm.

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² Conclusions for substances bearing CAS RNs 78-67-1, 13472-08-7, 61790-28-1, 61790-29-2 and 125328-64-5 are provided in the Substances Identified as Being of Low Concern based on the Ecological Risk Classification of Organic Substances and the Threshold of Toxicological Concern (TTC)-based Approach for Certain Substances Screening Assessment.

Considering all available lines of evidence presented in this draft screening assessment, there is low risk of harm to the environment from acetonitrile. It is proposed to conclude that acetonitrile does not meet the criteria under paragraphs 64(a) or (b) of CEPA as it is not entering the environment in a quantity or concentration or under conditions that have or may have an immediate or long-term harmful effect on the environment or its biological diversity or that constitute or may constitute a danger to the environment on which life depends.

Acetonitrile has been reviewed internationally through the Organization of Economic Co-operation and Development Cooperative Chemicals Assessment Programme where it was determined that acetonitrile is not considered to be mutagenic, carcinogenic, nor a reproductive toxicant. The critical effect was based on haematological effects observed in mice following chronic repeat dose inhalation exposure.

The general population of Canada may be exposed to acetonitrile from environmental media. A comparison of estimated exposure to acetonitrile from environmental media and critical effect levels results in margins of exposure that are considered adequate to address uncertainties in the health effects and exposure databases.

On the basis of the information presented in this draft screening assessment, it is proposed to conclude that acetonitrile does not meet the criteria under paragraph 64(c) of CEPA as it is not entering the environment in a quantity or concentration or under conditions that constitute or may constitute a danger in Canada to human life or health.

It is therefore proposed to conclude that acetonitrile does not meet any of the criteria set out in section 64 of CEPA.

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1. Introduction

Pursuant to section 74 of the *Canadian Environmental Protection Act, 1999* (CEPA) (Canada 1999), the Minister of the Environment and the Minister of Health have conducted a screening assessment of one of six substances (acetonitrile, Chemical Abstracts Service Registry Number [CAS RN³] 75-05-8) referred to under the Chemical Management Plan as the Nitriles Group, to determine whether this substance presents or may present a risk to the environment or to human health. The substance was identified as a priority for assessment as it met categorization criteria under subsection 73(1) of CEPA (ECCC, HC [modified 2017]).

The other five substances (the CAS RN are listed in Table 1-1, below) were considered in the ecological risk classification of organic substances (ERC) and the Threshold of Toxicological Concern (TTC)-based Approach for Certain Substances science approach documents (ECCC 2016a; Health Canada 2016) and were identified as being of low concern to both human health and the environment. As such, they are not further addressed in this report. Conclusions for these five substances are provided in the Substances Identified as Being of Low Concern on the basis of the Ecological Risk Classification of Organic Substances and the Threshold of Toxicological Concern (TTC)-based Approach for Certain Substances Screening Assessment (ECCC, HC 2018).

Table 1-1. Substances in the Nitrile Group that were addressed under other approaches

CAS RN	<i>Domestic Substances List</i> name
78-67-1	Propanenitrile, 2,2'-azobis[2-methyl-
13472-08-7	Butanenitrile, 2,2'-azobis[2-methyl-
61790-28-1	Nitriles, tallow
61790-29-2	Nitriles, tallow, hydrogenated
125328-64-5	Nitriles, rape-oil, hydrogenated

The ecological risk of acetonitrile was characterized using the ERC approach (ECCC 2016a). The ERC describes the hazard of a substance using key metrics including mode of toxic action, chemical reactivity, food web-derived internal toxicity thresholds, bioavailability, and chemical and biological activity and considers the possible exposure of organisms in the aquatic and terrestrial environments on the basis of factors such as potential emission rates, overall persistence and long-range transport potential in air. The various lines of evidence are combined to identify substances as warranting further

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evaluation of their potential to cause harm to the environment or as having a low likelihood of causing harm to the environment.

The substance, acetonitrile, has been reviewed internationally through the Organisation for Economic Co-operation and Development (OECD) Cooperative Chemicals Assessment Programme and there is an OECD SIAR (SIDS Initial Assessment Report) available. These assessments undergo rigorous review (including peer-review) and endorsement by international governmental authorities. Health Canada and Environment and Climate Change Canada are active participants in this process, and consider these assessments to be reliable. The OECD SIAR was used to inform the health effects characterization in this screening assessment.

This draft screening assessment includes consideration of information on chemical properties, environmental fate, hazards, uses and exposures, including additional information submitted by stakeholders. Relevant data were identified up to July 2018.

This draft screening assessment was prepared by staff in the CEPA Risk Assessment Program at Health Canada and Environment and Climate Change Canada and incorporates input from other programs within these departments. The ecological portion of this assessment is based on the ERC document (published July 30, 2016), which was subject to an external review as well as a 60-day public comment period. While external comments were taken into consideration, the final content and outcome of the screening assessment remain the responsibility of Health Canada and Environment and Climate Change Canada.

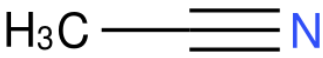
This draft screening assessment focuses on information critical to determining whether substances meet the criteria as set out in section 64 of CEPA by examining scientific information and incorporating a weight of evidence approach and precaution.⁴ This draft screening assessment presents the critical information and considerations on which the proposed conclusion is based.

⁴A determination of whether one or more of the criteria of section 64 of CEPA are met is based upon an assessment of potential risks to the environment and/or to human health associated with exposures in the general environment. For humans, this includes, but is not limited to, exposures from ambient and indoor air, drinking water, foodstuffs, and products available to consumers. A conclusion under CEPA is not relevant to, nor does it preclude, an assessment against the hazard criteria specified in the *Hazardous Products Regulations*, which are part of the regulatory framework for the Workplace Hazardous Materials Information System for products intended for workplace use. Similarly, a conclusion based on the criteria contained in section 64 of CEPA does not preclude actions being taken under other sections of CEPA or other acts.

2. Substance identity

The CAS RN⁵, *Domestic Substances List* (DSL) name and structure for acetonitrile are presented in Table 2-1.

Table 2-1. Substance identity

CAS RN	DSL name	Chemical structure and molecular formula ^a	Molecular weight (g/mol) ^a
75-05-8	acetonitrile	 C ₂ H ₃ N	41.1

^a PubChem 2004- .

3. Physical and chemical properties

A summary of physical and chemical property data of acetonitrile are presented in Table 3-1. Additional physical chemical properties are reported in ECCC 2016b.

Table 3-1. Experimental physical and chemical property values (at standard temperature) for acetonitrile

Property	Value (or range)	Key reference(s)
Physical state	Colourless liquid	ECHA 2018; Lewis 2007; Rumble 2002; SDS 2017
Melting point (°C)	-41 to -48	ECHA 2018; Lewis 2007; Rumble 2002; SDS 2017
Vapour pressure (Pa)	9.45 × 10 ³ to 12.1 × 10 ³	ECHA 2018; Rumble 2002; SDS 2017
Water solubility	Miscible	ECHA 2018; Lewis 2007; Rumble 2002; SDS 2017
Log K _{ow} (dimensionless)	-0.34	Hansch and Anderson 1967

Abbreviations: K_{ow}, octanol-water partition coefficient.

4. Sources and uses

Acetonitrile was included in a survey issued pursuant to a CEPA section 71 notice (Canada 2012). The substance was not reported to be manufactured above the reporting threshold of 100 kg during the 2011 calendar year in Canada, while total import quantities during that same period were reported in a range of 10 000 to

100 000 kg for use in laboratories (Environment Canada 2013)⁶. The substance is also present as a formulant in three pest control products registered in Canada (email from Pest Management Regulatory Agency, Canada, to Existing Substances Risk Assessment Bureau, Health Canada, dated April 5, 2018; unreferenced).

5. Potential to cause ecological harm

5.1 Characterization of ecological risk

The ecological risk of acetonitrile was characterized using the ecological risk classification of organic substances (ERC) approach (ECCC 2016a). The ERC is a risk-based approach that considers multiple metrics for both hazard and exposure, on the basis of weighted consideration of multiple lines of evidence for determining risk classification. The various lines of evidence are combined to discriminate between substances of lower or higher potency and lower or higher potential for exposure in various media. This approach reduces the overall uncertainty with risk characterization compared to an approach that relies on a single metric in a single medium (e.g., median lethal dose [LC₅₀]) for characterization. The following summarizes the approach, which is described in detail in ECCC (2016a).

Data on physical-chemical properties, fate (chemical half-lives in various media and biota, partition coefficients, and fish bioconcentration), acute fish ecotoxicity, and chemical import or manufacture volume in Canada were collected from the scientific literature, available empirical databases (e.g., OECD [Q]SAR Toolbox 2016), and from responses to surveys conducted under section 71 of CEPA, or they were generated using selected quantitative structure-activity relationship ([Q]SAR) or mass-balance fate and bioaccumulation models. These data were used as inputs to other mass-balance models or to complete the substance hazard and exposure profiles.

Hazard profiles were established principally on metrics regarding mode of toxic action, chemical reactivity, food web-derived internal toxicity thresholds, bioavailability, and chemical and biological activity. Exposure profiles were also based on multiple metrics, including potential emission rate, overall persistence, and long-range transport potential. Hazard and exposure profiles were compared to decision criteria in order to classify the hazard and exposure potentials for each organic substance as low, moderate, or high. Additional rules were applied (e.g., classification consistency, margin of exposure) to refine the preliminary classifications of hazard or exposure.

⁶ Values reflect quantities reported in response to a survey conducted under section 71 of CEPA (Canada 2012). See survey for specific inclusions and exclusions (Schedules 2 and 3).

A risk matrix was used to assign a low, moderate or high classification of potential risk for each substance on the basis of its hazard and exposure classifications. ERC classifications of potential risk were verified using a two-step approach. The first step adjusted the risk classification outcomes from moderate or high to low for substances that had a low estimated rate of emission to water after wastewater treatment, representing a low potential for exposure. The second step reviewed low risk potential classification outcomes using relatively conservative, local-scale (i.e., in the area immediately surrounding a point-source of discharge) risk scenarios, designed to be protective of the environment, to determine whether the classification of potential risk should be increased.

ERC uses a weighted approach to minimize the potential for both over and under classification of hazard, exposure and subsequent risk. The balanced approaches for dealing with uncertainties are described in greater detail in ECCC 2016a. The following describes two of the more substantial areas of uncertainty. Error with empirical or modelled acute toxicity values could result in changes in classification of hazard, particularly metrics relying on tissue residue values (i.e., mode of toxic action), many of which are predicted values from (Q)SAR models. However, the impact of this error is mitigated by the fact that overestimation of median lethality will result in a conservative (protective) tissue residue value used for critical body residue (CBR) analysis. Error with underestimation of acute toxicity will be mitigated through the use of other hazard metrics such as structural profiling of mode of action, reactivity and/or estrogen binding affinity. Changes or errors in chemical quantity could result in differences in classification of exposure as the exposure and risk classifications are highly sensitive to emission rate and use quantity. The ERC classifications thus reflect exposure and risk in Canada based on what is believed to be the current use quantity, and may not reflect future trends.

Critical data and considerations used to develop the substance-specific profiles for acetonitrile, and the hazard, exposure and risk classification results, are presented in ECCC (2016b).

On the basis of low hazard and low exposure classifications according to information considered under ERC, acetonitrile was classified as having a low potential for ecological risk. It is therefore unlikely that this substance is resulting in concerns for the environment in Canada.

6. Potential to cause harm to human health

6.1 Exposure assessment

Natural occurrences of acetonitrile have been identified in the combustion products of wood and other biomass (ECB 2002; Yuan et al 2010), volcanic gas (Schwandner et al. 2004) and coal tar (Islas et al. 2002).

No reports of acetonitrile measured in drinking water in Canada were identified. According to the National Pollutant Release Inventory (NPRI) database, there were no reported releases of acetonitrile to water or to municipal wastewater treatment systems for the reporting years 2011 to 2017 (NPRI 2018).

In the NPRI database the average total annual release of acetonitrile to air was 40.25 tonnes for the reporting years 2006 to 2013, decreasing to an average of 18.25 tonnes for the reporting years 2014 to 2017. The overall degradation half-life for acetonitrile in the troposphere has been estimated to be between 42 and 321 days (ECB 2002; US EPA 1987).

As part of a series of residential air quality studies, Health Canada (2006, 2007, 2009, 2010) collected indoor and outdoor air samples for analysis of selected volatile organic compounds, including acetonitrile. Sampling took place during the summer and winter seasons in Edmonton (2010), Halifax (2009), Regina (2007), and Windsor (2005 to 2006). With the exception of the summer sampling period for indoor air in Halifax, detection frequencies for acetonitrile were greater than 70% (with a method detection limit of 0.047 $\mu\text{g}/\text{m}^3$).

The Health Canada (2006, 2007, 2009, 2010) air quality studies consisted of paired indoor-outdoor air measurements (i.e., simultaneous measurements were taken inside and outside the residence (e.g., a backyard) during sampling). The ratio of indoor-air to outdoor-air acetonitrile levels for residences of non-smokers was less than 2, but as great as 18 for residences occupied by smokers. These results suggest the source(s) of elevated acetonitrile levels in indoor air originates from inside the residence and is not a result of ambient infiltration. Furthermore, tobacco smoke is a known source of acetonitrile (IPCS 1993; US EPA 1985) and is a contributing factor for acetonitrile levels being on average greater indoors compared to outdoors. According to Health Canada (2007) the geometric mean of acetonitrile levels in indoor air of residences occupied by smokers was approximately 7 times greater in comparison to residences of non-smokers (2.318 $\mu\text{g}/\text{m}^3$ and 0.294 $\mu\text{g}/\text{m}^3$, respectively).

In this assessment, the 95th percentile indoor air concentration based on a full data set (i.e., from residences comprised of smokers and exclusively non-smokers) is selected to estimate inhalation exposure to acetonitrile in indoor air. The 95th percentile reported from Regina during the summer sampling period was 4.99 $\mu\text{g}/\text{m}^3$ and is considered to be both a protective and representative exposure estimate for the general population. In comparison, the 95th percentile for residences where no smoking was reported was in the range of 0.46 to 0.81 $\mu\text{g}/\text{m}^3$.

The 95th percentile concentration for outdoor air, reported in Edmonton (summer sampling period; 1.21 $\mu\text{g}/\text{m}^3$), was the highest 95th percentile outdoor air concentration reported (Health Canada 2006, 2007, 2009, 2010) and used to estimate inhalation exposure to acetonitrile while outdoors.

The estimated daily intake for all age groups for acetonitrile via inhalation ranged from 0.92 µg/kg bw/day to 3.29 µg/kg bw/day, with children aged 1 to 2 years old having the highest estimated exposure (See Appendix A. Estimated daily intake from inhalation exposures to humans for details).

6.2 Health effects assessment

OECD (1997) summarized the health effects literature and characterized the hazard for acetonitrile. The final assessment report from the OECD (SIAR) was published in 2002 by the European Chemicals Bureau (ECB) in the European Union (ECB 2002). The EU Risk Assessment Report (RAR) (ECB 2002) was used to inform the health effects characterization in this screening assessment, including selection of effect levels for critical endpoints.

A literature search was conducted for information more recent than the date of the last literature review, 1998, as reported in the EU report (ECB 2002). No health effects studies which could impact the risk characterization (i.e., result in different critical endpoints or lower points of departure than those stated in ECB 2002) were identified. In addition, reviews on acetonitrile from the US EPA (IRIS 1997), Australia (AGDH 2018) and Japan (J-CHECK c2010-) were consulted as part of the extended literature search.

As reported by the ECB (2002), toxicokinetic data has shown that acetonitrile is well absorbed from the lungs and gastrointestinal tract and rapidly distributed throughout the body. Cyanide is the primary metabolite of acetonitrile, via cytochrome P450 metabolic biotransformation (ECB 2002; IRIS 1997-).

In repeat dose inhalation exposure studies mice were found to be a sensitive species to acetonitrile (ECB 2002). The NTP (1996) conducted 13-week inhalation studies on both the F344/N rat and B6C3F₁ mouse. In rats, groups of 10 males and females were exposed to 0, 100, 200, 400, 800 or 1600 ppm acetonitrile by inhalation for 6 hours per day, 5 days per week for 13 weeks. The same concentrations and dosing regimens were administered to groups of 10 male and 10 female B6C3F₁ mice over 13 weeks. The results of these studies were used to inform dose selection for a subsequent 2 year inhalation study on F344/N rats and B3C6F₁ mice. The 2-year inhalation study exposed groups of 60 male and 60 female B3C6F₁ mice to 0, 50, 100 or 200 ppm acetonitrile for 6 hours a day for 5 days per week. In the same 2-year inhalation study, groups of 56 male and 56 female F344/N rats were exposed to concentrations of 0, 100, 200 or 400 ppm of acetonitrile for 6 hours per day, 5 days per week (NTP 1996). The ECB (2002) summarized the results of these studies and identified a NOAEC of 200 ppm (335 mg/m³) for the F344/N rat based on haematological effects, such as mean erythrocyte haemoglobin and mean erythrocyte volume, observed to be minimally lower than controls at 400 ppm (670 mg/m³) in the 2-year study.

The US EPA (1987) and the ECB (2002) reviewed the results of a 92 day unpublished inhalation study in B3C6F₁ mice by Coate (1983). In the study, groups of 10 male and

10 female mice were exposed for 6 hours/day for 65 days over a 92 day period to concentrations of 0, 25, 50, 100, 200 and 400 ppm acetonitrile vapour (ECB 2002; US EPA 1987). A NOAEC of 100 ppm (168 mg/m³) was identified based on a significant decrease in blood urea nitrogen levels, hematocrits and erythrocytes, amongst other haematological effects, at higher doses.

Based on data from the NTP (1996) studies, as well as additional repeat dose inhalation effects observed from a number of unpublished studies, including the study by Coate (1983), evaluated as part of their toxicological assessment of acetonitrile, the ECB (2002) identified a NOAEC of 100 ppm (168 mg/m³) based on haematological effects, including statistically significant decreases in blood urea levels, red blood cell cholinesterase counts and hematocrits in female mice (ECB 2002; US EPA 1987). The selection of a NOAEC in mice of 100 ppm (168 mg/m³) as the critical effect for chronic repeat dose exposures to acetonitrile (ECB 2002; OECD 1997) is consistent with the value selected by other international agencies, including the US EPA (IRIS 1997-), Japan (J-CHECK c2010-) and Australia (AGDH 2018).

Acetonitrile is not considered to be mutagenic or carcinogenic based on available data (AGDH 2018; ECB 2002; IRIS 1997). The reproductive and developmental toxicity of acetonitrile has been examined in a number of studies. ECB 2002 reported that in most available studies, where reproductive and/or developmental effects were observed, the effects were associated with maternal toxicity. In rabbits administered acetonitrile by oral gavage, a NOAEL of 30 mg/kg bw/day for developmental effects was reported (highest dose tested), with a NOAEL for maternal toxicity reported at 15 mg/kg bw/day (mid dose). The maternal toxicity in this study was associated with reduced body weight gain during the exposure period (AGDH 2018; ECB 2002- ; IRIS 1997-). Similarly, in two developmental toxicity inhalation studies reported for SD rats, a NOAEC for maternal toxicity of 1200 ppm (2015 mg/m³) was observed, with higher doses associated with effects on maternal body weights. The NOAEC for developmental toxicity from these studies was determined to be >1200 ppm (2015 mg/m³). A NOAEC of 1500 ppm (2518 mg/m³) was reported in an inhalation study, in which an increase in the percentage of non-surviving implants and early embryonic reabsorptions were observed in SD rats exposed to the next concentration tested of 1800 ppm (3023 mg/m³). There were no other developmental effects observed at this dose, including no significant changes in the average number of implantation sites or incidences of skeletal variations (AGDH 2018; ECB 2002- ; IRIS 1997-). The ECB (2002) concluded, based on the available information, that acetonitrile “is not a reproductive toxicant”.

6.3 Characterization of risk to human health

Empirical ambient and indoor air measurements were identified for acetonitrile in a series of residential air quality studies conducted in four cities across Canada, resulting in estimated daily intakes of acetonitrile ranging from 0.92 µg/kg bw/day to 3.29 µg/kg bw/day, with children ages 1 to 2 years old having the highest estimated exposure.

To calculate margins of exposure (MOEs) for acetonitrile from inhalation the most appropriate toxicological endpoint was considered to be the NOAEC of 100 ppm (168 mg/m³) which was identified based on effects observed in a number of studies. The critical effect at this concentration was based on haematological effects observed in mice after chronic repeat dose inhalation exposures. The NOAEC of 100 ppm (168 mg/m³) is calculated to be equivalent to a 58.8 mg/kg bw/day.

Comparison of the estimated daily intake for acetonitrile with the selected critical effect levels results in margins of exposure (MOEs) ranging from 17 872 to 63 913. These MOEs are considered adequate to address uncertainties in the health effects and exposure databases.

6.4 Uncertainties in evaluation of risk to human health

No measured data were identified for drinking water in Canada or elsewhere.

7. Conclusion

Considering all available lines of evidence presented in this draft screening assessment, there is low risk of harm to the environment from acetonitrile. It is proposed to conclude that acetonitrile does not meet the criteria under paragraphs 64(a) or (b) of CEPA as it is not entering the environment in a quantity or concentration or under conditions that have or may have an immediate or long-term harmful effect on the environment or its biological diversity or that constitute or may constitute a danger to the environment on which life depends.

On the basis of the information presented in this draft screening assessment, it is proposed to conclude that acetonitrile does not meet the criteria under paragraph 64(c) of CEPA as it is not entering the environment in a quantity or concentration or under conditions that constitute or may constitute a danger in Canada to human life or health.

It is therefore proposed to conclude that acetonitrile does not meet any of the criteria set out in section 64 of CEPA.

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Appendix A. Estimated daily intake from inhalation exposures to humans

Table A-1. Estimates of daily intake ($\mu\text{g}/\text{kg bw}/\text{day}$) of acetonitrile

Route of exposure	0 to 5 months ^a	6 to 11 months ^b	1 year ^c	2 to 3 years ^d	4 to 8 years ^e	9 to 13 years ^f	14 to 18 years ^g	19 years or older ^h
Ambient air ⁱ	0.09	0.09	0.11	0.09	0.07	0.05	0.04	0.03
Indoor air ^j	2.56	2.59	3.18	2.68	2.11	1.45	1.12	0.89
Total intake	2.65	2.68	3.29	2.77	2.18	1.49	1.16	0.92

^a Assumed to weigh 6.3 kg (Health Canada 2015), to breathe 3.7 m³ of air per day (US EPA 2011 [modified]).

^b Assumed to weigh 9.1 kg (Health Canada 2015), to breathe 5.4 m³ of air per day (US EPA 2011 [modified]).

^c Assumed to weigh 11 kg (Health Canada 2015), to breathe 8.0 m³ of air per day (US EPA 2011 [modified]).

^d Assumed to weigh 15 kg (Health Canada 2015), to breathe 9.2 m³ of air per day (US EPA 2011 [modified]).

^e Assumed to weigh 23 kg (Health Canada 2015), to breathe 11.1 m³ of air per day (US EPA 2011 [modified]).

^f Assumed to weigh 42 kg (Health Canada 2015), to breathe 13.9 m³ of air per day (US EPA 2011 [modified]).

^g Assumed to weigh 62 kg (Health Canada 2015), to breathe 15.9 m³ of air per day (US EPA 2011 [modified]).

^h Assumed to weigh 74 kg (Health Canada 2015), to breathe 15.1 m³ of air per day (US EPA 2011 [modified]).

ⁱ 1.21 $\mu\text{g}/\text{m}^3$ as reported as the 95th percentile of 50 samples collected during the summer season from Edmonton (AB) (Health Canada 2010). Canadians are assumed to spend 3 hours outdoors each day (Health Canada 1998).

^j 4.99 $\mu\text{g}/\text{m}^3$ as reported as the 95th percentile of 111 samples collected during the summer season from Regina (SK) (Health Canada 2007). Canadians are assumed to spend 21 hours indoors each day (Health Canada 1998).